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(54) Abrasive member

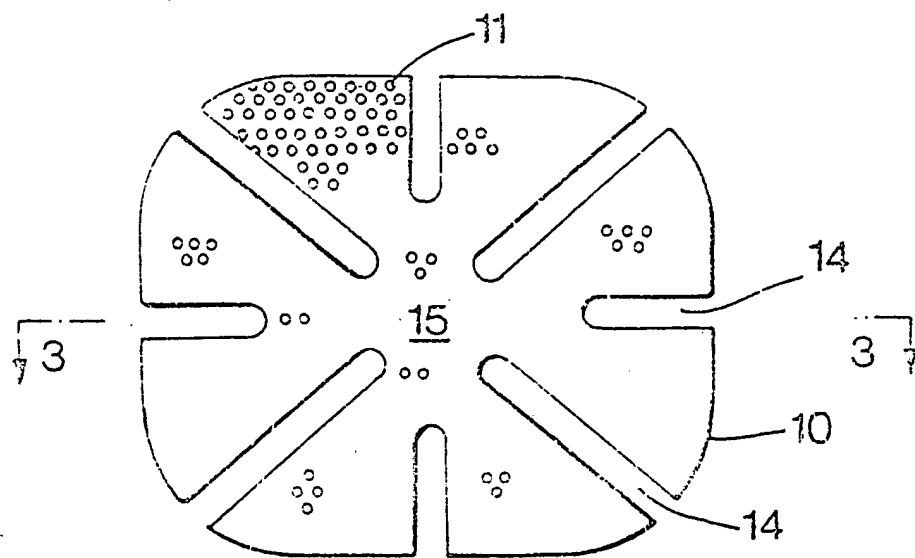
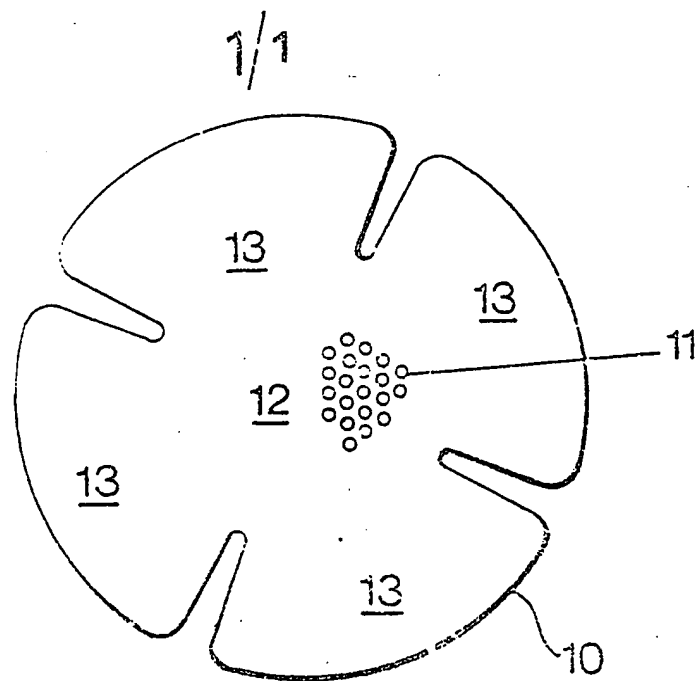
(57) A method of making an abrasive member includes forming a flowable mixture of resin and abrasive and applying the mixture, for example through masking means, onto a flexible backing member so that

discrete areas of resin and abrasive are formed. The resin is cured to harden the resin and cause it to adhere to the surface of the backing material.

The backing material may be woven material and in sheet form and the resin and abrasive may take various forms.

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## SPECIFICATION

## Abrasive member

This invention relates to abrasive members and to a method of making abrasive members.

5 In our prior European Patent Application 79302792.1 (publication No. 0013486) we have described a flexible abrasive member particularly suitable for grinding, smoothing and performing other operations on glass or other materials and a  
10 method of making the member. The member finds particular application in grinding lenses. This prior method includes applying discrete areas of metal in which abrasive particles are embedded to a flexible backing material in the form of mesh by  
15 means of an electro-deposition process. The members thus formed have been found to be highly effective in removing glass from lenses and they can be used both for removing a thickness of glass from lenses and for applying a smooth  
20 surface finish to the lenses. However it is usually required that two abrasive members need to be used, one containing a coarser grade of abrasive for providing a rough finished lens and the other containing a finer grade of abrasive for final  
25 finishing of the lens. It is desirable that a single abrasive member be used for removing a layer of the material of the lens and for applying a smooth finish prior to polishing.

Other methods of providing abrasive members  
30 have also been proposed. For example metal plates incorporating abrasive have been formed by powder metallurgy but such plates can not be formed in thin sections and are not flexible.

Apart from our prior method referred to above,  
35 other methods have employed electro-deposition of metal with embedded abrasive, such as disclosed in British Patent Specifications 1,375,571 and 1,458,236. The abrasive members resulting from these methods are flexible but have  
40 been found to be quite unsuitable for lens grinding.

There has also been proposed abrasive members comprising resin material incorporating abrasive but no way has hitherto been found of  
45 providing a resin based member which has the flexibility and resilience required. However, a resin-bonded abrasive sheet appears to provide more flexible seating for the individual abrasive particles compared with metal-bonded abrasive  
50 members.

An object of the invention is to provide an abrasive member and a method of making it by which an abrasive member is provided which is capable of removing a layer of material and of  
55 providing a smooth surface finish in one operation.

According to one aspect of the invention in a method of making an abrasive member a mixture of resin and abrasive particles is formed, the resin/abrasive mixture is applied to discrete areas  
60 of a flexible backing material and the resin/abrasive mixture is cured.

The backing material can be of any convenient form which provides the necessary flexibility and strength, for example woven material such as

65 cloth, nylon, polyester, nitril, or cotton can be used. Alternatively flexible paper, metal, plastics (e.g. polythene), or rubber, in sheet form, with or without perforations, can be used.

The application of the resin/abrasive mixture  
70 may be by any convenient means incorporating a mask, such as by silk screening, stencil, wire mesh, or by other means, such as syringes, probes or tubes in which discrete areas of the backing sheet can be applied with the resin/abrasive  
75 mixture in the desired pattern.

The pattern of the discrete areas applied with the resin-abrasive mixture varies according to the use to which the member is to be put. Thus the areas can be equal or unequal in size and they may  
80 be large or small.

For example the areas can range in size from the size of a small dot to an area several inches across. The spacing between the areas can similarly be varied from closely spaced to widely  
85 spaced areas. When used to effect a high surface finish on small sized sensitive materials, such as small ceramic insulators and thin glass sections, the areas of resin/adhesive may be small and closely spaced. When used to effect smoothing of  
90 larger surfaces such as slabs of marble or other stone the areas of resin adhesive may be considerably larger and more widely spaced to allow the passage of coolant and waste materials.

The nature of the abrasive material used  
95 depends on the application of the finished abrasive member. Suitable materials include natural and synthetic diamond, synthetic Borazon, silicon carbide, zinc oxide, aluminium oxide, cerium oxide, alone or in combination. The size of the abrasive may be from 0—1 micron up to  
100 1 mm dependent on the application of the member.

A wide range of proprietary resins are suitable for use with the method of the invention and in  
105 curing the resin the curing conditions will be dependent on the resin used. In general a higher curing temperature results in a lower curing and hardening period.

Suitable resins include epoxy resins such as  
110 those sold by Coates Special Products Limited under the designations XZ06, XZ 09, XZ 12, XZ15—17, XZ39 and XZ40, and those resins sold by Ciba-Geigy under the designations 2001, 2002, 2004—6 and AV 121, AV 123S, AV 129, AV 133, HV 133 and AV 138.

According to a second aspect of the invention an abrasive member formed by the method of the invention comprises a flexible backing material on which is adhered discrete areas of a resin/abrasive  
120 mixture.

The method of the invention may result in a length of backing material on which a pattern of discrete areas of cured resin/abrasive is formed in which case the length may be cut to the desired  
125 shape of individual abrasive members.

Alternatively the backing material may be cut to the desired shape before the resin/abrasive mixture is applied.

The shapes of the individual abrasive members

may take many forms dependent on the intended use of the member. For example if the members are to be used on marble or granite they may be circular and up to 50 cms in diameter and they may have waterways for flushing away ground-off material. The members may be formed in strips for orbital sanding machines or in endless lengths for other sanding machines. When used for finishing moulds the members may be dome- or cup-shaped.

The abrasive member may, in some cases, be applied to a rigid base member by adhering the backing material, with the side bearing the areas of resin/abrasive uppermost to the base member.

The base member may be a flat or curved metal block, the shape being dependent on the application of the member. Although the base member is in this case rigid the resilient backing material enables the individual areas of resin/abrasive to be resiliently located and able to absorb shock loadings in use.

When used for grinding ophthalmic lenses the abrasive members may be in one of the forms shown in the accompanying drawings in which:

Fig. 1 is a plan view of one embodiment, Fig. 2 is a plan view of another embodiment, and

Fig. 3 is a cross section on line 3—3 in Fig. 2.

Referring to the drawings a flexible backing sheet 10 is applied all over one of its surfaces with discrete circular areas 11 of cured resin abrasive material. In the case of the Fig. 1 embodiment the sheet 10 is of generally circular shape having a central portion 12 from which extends part-segmental portions 13, each of which has a regular pattern of the abrasive areas 11 standing proud of the backing sheet 10.

In the Fig. 2 embodiment the sheet 10 is generally square with rounded corners and slots 14 are formed extending inwards from the corners and the side edges towards a central portion 15.

In each case the areas 11 of resin and abrasive are spaced apart in such a manner that the flexible backing material between the areas can flex freely without the areas 11 cracking and the resulting member is freely flexible to conform to the article being ground and/or polished.

The abrasive members of the invention have been found to be simple to make and they give the facility for removing layers of material from the article to be ground and at the same time to give a finely smoothed finish. In addition it has been found possible to incorporate into the resin fine abrasive particles of the smallest sizes which hitherto have been difficult to use in electroplated and other abrasive members. The fixing of the resin/abrasive areas to flexible, resilient backing material gives the abrasive material the ability to absorb shock loadings. The use of resin gives a seating for the abrasive particles which is relatively flexible and enables a smooth finish to be achieved.

## CLAIMS

1. A method of making an abrasive member

65 wherein a flowable mixture of resin and abrasive particles is formed, portions of the resin/abrasive mixture are deposited directly onto a flexible backing member to form discrete areas of the mixture, and the resin/abrasive mixture is cured to  
70 harden the mixture and cause it to adhere to the backing material.

2. A method according to claim 1 wherein the flexible backing material is a woven material.

3. A method according to claim 2 wherein the  
75 flexible backing material is selected from cloth, nylon, polyester, nitril and cotton.

4. A method according to claim 1 wherein the flexible backing material is in sheet form and is selected from flexible paper, metal, plastics and  
80 rubber.

5. A method according to claim 4 wherein the material has perforations.

6. A method according to any one of the preceding claims wherein the resin/abrasive  
85 mixture is applied to the backing material through a mask having a plurality of openings corresponding to the discrete areas to which the mixture is to be applied.

7. A method according to claim 6 wherein the  
90 mask is in a form selected from silk screen means, stencil means, wire mesh means.

8. A method according to any one of claims 1—5 wherein the resin/abrasive mixture is applied by applicator means in the form of syringe  
95 means, probe means or tube means to discrete areas of the backing material.

9. A method according to any one of the preceding claims wherein said discrete areas are regularly spaced over one side of the backing  
100 material.

10. A method according to any one of the preceding claims wherein the abrasive particles are selected from natural and synthetic diamond, synthetic Borozone, silicon carbide, zinc oxide,  
105 aluminium oxide, cerium oxide, alone or in combination.

11. A method according to claim 10 wherein the abrasive particles are in the size range 0—1 micron to 1 mm.

12. A method according to any one of the preceding claims wherein the resin is an epoxy resin.

13. A method according to any one of the preceding claims wherein the resin/abrasive  
115 mixture is in liquid, semi-liquid or paste form when applied to the backing member.

14. An abrasive member comprising a flexible backing material to which is adhered discrete areas of cured resin/abrasive mixture.

15. A member according to claim 14 wherein the backing material is a woven material selected from cloth, nylon, polyester, nitril and cotton.

16. A member according to claim 14 wherein the backing material is sheet material selected from flexible paper, metal, plastics and rubber, with or without perforations.

17. A member according to any one of claims 14—16 wherein the discrete areas of resin/abrasive mixture are regularly spaced over

one side of the backing material.

18. A member according to claim 17 wherein the areas of resin/abrasive are spaced to provide ways for flushing away ground off material.

5 19. A member according to any one of claims 14—18 wherein the backing material is adhered

to a rigid base member.

20. A member according to any one of claims 14—19 wherein the abrasive particles are in the  
10 size range of 1 micron to 1 mm.

21. An abrasive member substantially as described with reference to the drawings.

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